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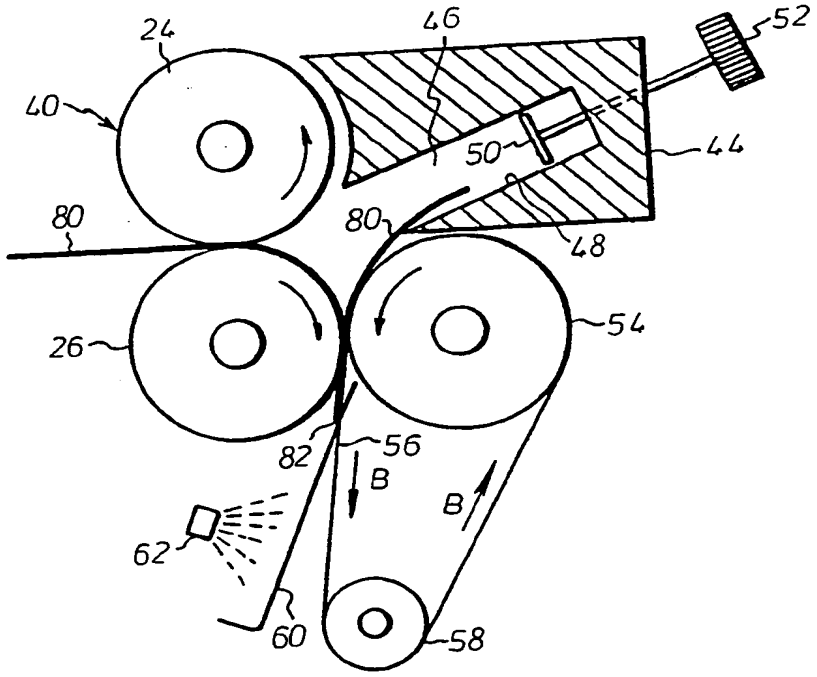
(57) Abstract

The invention relates to a method and an apparatus for folding single-side adhesive coated label strips (80) of which two parts of different lengths are folded together with their adhesive sides facing each other, along a line (82) transverse to the label strip (80) to form a folded-back label where the end portion of the longer part projects beyond the glued-together label portion, thereby exposing the adhesive coat of said projecting end portion. The label strip (80) is advanced towards a stop (50) against which the leading end edge of the label strip (80) is caused to abut to prevent continued advance of the leading strip section (80). Then the trailing section of the label strip (80) is further advanced, such that the strip portion located at the said line (82) is deflected towards the nonadhesive surface of the strip (80) in a direction substantially perpendicular to the plane of the label strip. Counteracting pressure forces are applied to the nonadhesive surfaces of the deflected label strip portion (80) on both sides of the said line (82) to sharply fold the label strip (80) along the said line (82) and compress the adhesive surfaces of the unequally long parts of the label strip.



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METHOD AND APPARATUS FOR MAKING FOLDED-BACK LABELS

The present invention relates to a method and an apparatus for making folded-back labels. More particularly, the invention relates to a method and an apparatus for folding single-side adhesive coated label strips of which two parts of different lengths are folded together with their adhesive sides facing each other, along a line transverse to the label strip to form a folded-back label where the end portion of the longer part projects beyond the glued-together label portion, thereby exposing the adhesive coat of said projecting end portion.

Such folded-back labels with projecting adhesive coats are used for example, but in no way exclusively, for application to such products as sheets, signatures or publications, for example newspapers, which are advanced on a conveyor in overlapping relationship. During the advance of such products, the number of copies is traditionally counted, and whenever a predetermined number of copies has been counted, a marking is applied. For such marking, for example for every 100 newspapers, use may be made of folded-back labels of the type mentioned above, the projecting portion of the folded-back label being attached with its exposed adhesive coat to the edge of a newspaper selected by the counting operation, such that, when the advanced newspapers have been collected in a stack, the labels attached to the newspapers project with their folded-back portions from one side of the stack to mark for example every 100th newspaper.

A method and an apparatus for making and applying such folded-back labels are disclosed in SE 442,979 which describes an apparatus in which a continuous single-side adhesive coated tape is delivered from a

supply reel to a cutting station where it is cut into label strips of predetermined length. The as yet unfolded label strips are then advanced to a folding device in which they are folded and which comprises, as seen in the direction of label movement, a first stationary belt conveyor and a second belt conveyor which is pivotal in relation to said first belt conveyor. Each label strip received from the cutting station is placed with its nonadhesive side on the first belt conveyor on which it is retained, during the advance thereof, by vacuum suction boxes arranged underneath the air-permeable supporting surface of the conveyor. Then the label strip is advanced by the first belt conveyor to the second belt conveyor into a position such that a trailing label strip section still lies against the first belt conveyor and a leading label strip section lies against the second belt conveyor, said trailing and leading sections of the label strip having different lengths. In this position in which the label strip thus is in contact with both belt conveyors, a pneumatic cylinder causes the second belt conveyor to pivot towards the first belt conveyor so that the adhesive sides of the two unequally long label strip portions are folded against one another into adhesive engagement between the folded-together belt conveyors. The thus folded label is then retained against the second belt conveyor by vacuum suction boxes, while this belt conveyor is returned into its initial position, whereupon the folded-back label is lifted off the second belt conveyor and applied to, for example, a newspaper by a collector/applicator especially designed for this purpose and comprising, in the prior art apparatus referred to above, a pivotal arm with vacuum suction means at its free end for holding the folded-back label, and pressing means for pressing the label on the product.

The apparatus disclosed by SE 442,979 has several shortcomings. In the first place, it comprises a large number of moving parts, such as belt conveyors and pneumatic cylinders, and vacuum suction means required for holding the label during the folding thereof. Taken together, these elements make the apparatus bulky, high-priced and unreliable. In the second place, the position of the label strip on the belt conveyors is not readily controllable so that the label may be folded askew, i.e. folded along a line which is not perpendicular to the direction of label movement, or the projecting portion carrying the exposed adhesive coat may obtain an inappropriate length.

These and other shortcomings encountered in prior art technique constitute the basis of the present invention which aims at providing a method and an apparatus for conveniently and reliably folding label strips to form such folded-back labels, while utilising but a few moving elements.

To this end, the present invention provides a method and an apparatus of the type mentioned by way of introduction, in which each label strip in the unfolded state is advanced substantially perpendicular to the fold line towards a stop against which the leading end edge of the label strip is caused to abut to prevent continued advance of the leading strip section. Then the trailing section of the label strip is further advanced, such that the strip portion located at the said line is deflected towards the nonadhesive side of the strip in a direction substantially perpendicular to the plane of the label strip. Then, counteracting pressure forces are applied to the nonadhesive faces of the deflected label strip portion on both sides of the said line to sharply fold the label strip along the said line and compress the adhesive faces of the unequally long parts of the label strip.

In a preferred embodiment of the invention, the said nonadhesive sides of the deflected label strip portion on both sides of the said line are also subjected to advancing forces acting in the deflecting direction, for example by means of two converging advance and pressure surfaces producing the above-mentioned compression of the label and simultaneously advancing the folded label in the deflecting direction.

By using such a stop, a highly well-defined label position is obtained prior to folding, and this in turn implies that the position of the line along which the label strip is folded will also be well-defined.

The position of the stop, as seen in the direction of label strip movement, is preferably variable to facilitate adaptation to label strips of different lengths, and to enable the operator, by minor adjustments of the stop position, to finely adjust the position of the line along which folding occurs.

These and other features of the method and the apparatus of the invention are defined in more detail in the appended claims.

The invention will now be described in more detail with reference to the accompanying drawings in which Figs. 1-8 show an apparatus comprising a preferred embodiment of the folding device according to the invention and illustrate sequentially the mode of operation of the apparatus and the folding device.

The apparatus shown in Fig. 1 comprises a supply reel 10 on which a continuous single-side adhesive coated tape 12 is wound which is supplied from said reel in the direction of arrow A, the adhesive-coated tape side being turned upwards. The tape 12 is advanced toward a first free-running pulley 14 where the tape 12 is deflected upwardly towards a second free-running pulley 16 where the tape 12 is deflected downwardly towards a first pair of feed rolls 18, 20. By guiding the tape

12 over the pulley 16 which, in Fig. 1, is upwardly offset, it is intended to eliminate, for the subsequent advance of the tape through the apparatus, any remaining tape bend that may have developed when the tape was wound onto the supply reel 10.

The tape received from the pulley 16 is inserted between and advanced by the roll pair 18, 20 of which the upper roll 18 which engages the adhesive tape face, is driving, and of which the lower roll 20 which engages the nonadhesive tape side, is spring-biased upwardly against the upper roll 18. To ensure that the tape 12 is smoothly advanced, and to prevent its adhesive surface from sticking to the upper roll 18, the upper roll 18 is preferably made of metal and given a knurled or serrated periphery, while the lower roll 20 is made of rubber and given a smooth peripheral surface.

From the roll pair 18, 20, the tape 12 is then fed past a cutting station generally designated 22 to a second pair of feed rolls 24, 26. In the embodiment illustrated, the roll pair 24, 26 is substantially identical with the roll pair 18, 20, i.e. the upper roll 24 is driving and made of metal with a knurled periphery, and the lower roll 24 is spring-biased upwardly against the upper roll 24 and made of rubber with a smooth peripheral surface.

The cutting station 22 comprises a cylinder 28 which may be, for example, of the pneumatic type and which has a vertically movable piston rod 30 which, at its lower free end, carries a knife 32 which is pushed down into a gap 38 defined by two tape supporting blocks 34, 36 for cutting the tape 12.

From the right-hand roll pair 24, 26 in Fig. 1, the cut tape is fed to a folding station which is generally designated 40 and from which folded labels ready for use are fetched by means of a collector/applicator generally designated 42.

The folding station 40 comprises a stationary frame 44 within which an obliquely upwardly extending slot is formed which is defined downwardly by a guide surface 48 and whose effective length can be controlled by means of a stop 50 which, for the reasons indicated below, is adjustable in the longitudinal direction of the slot 46 by means of a schematically shown adjusting screw 52 or like means. Furthermore, the folding station 40 comprises a driving roll 54 which is mounted to the right of the driving roll 26 and which, for the function of the folding station 40, is adapted to cooperate with the roll 26 in the manner disclosed below.

A belt 56 travels in the direction of arrows B in peripheral grooves formed in the roll 54 and over a smaller roll 58 underneath the roll 54. In the embodiment illustrated, the roll 54 is driving and the roll 58 is free-running. The folding station 40 also comprises a collecting trough 60 mounted underneath the rolls 26, 54 and a compressed-air nozzle 62 which is positioned on the side of the collecting trough 60 facing away from the belt 56 and which is adapted to direct an air stream against the collecting trough 60 and the belt 56.

The collector/applicator 42 comprises a pneumatic cylinder 68 which is pivotal about a pin 66 and whose piston rod 70 carries, at its end facing away from the cylinder 68, a suction and pressing block 72 which is hingedly suspended from the end of the piston rod 70 on a pin 74. The venting ducts required for the function of the suction and pressing block 72 are designated 76 and 78.

The function of the apparatus described above with reference to Fig. 1 will now be explained in detail with reference to Figs. 1-8 which illustrate sequentially how the tape 12 wound on the supply reel 10 is cut at the cutting station 22, how it is folded at the folding

station 40 to form folded-back labels ready for use, and how these folded-back labels are transferred to newspapers or like products by means of the collector/applicator 42.

In Fig. 1, the tape 12 is stretched between the roll pairs 18 and 20 and 24, 26 and projects with its leading end edge a short way into the folding station 40 to the right of the rolls 24, 26. In this position, the collector/applicator 42 is inactive in its retracted vertical position of rest.

In Fig. 2, the cylinder 28 has been activated to lower the vertically movable knife 32 for cutting the continuous tape 12 between the roll pairs 18, 20 and 24, 26. The cutting operation is controlled in such a manner that the resulting label strips 80 will have the same length, for example by detecting the angle of rotation of the drive roll 18 for activation of the cylinder 28 when a preset tape length has been advanced.

In Fig. 2, the resulting label strip 80 has been fed by the driving rolls 24, 26 into the slot 46 deflecting the tape at an angle α. While the label strip 80 is being advanced, the lower guide surface 48 of the groove is in contact with the nonadhesive strip side and imparts to the strip an initial bend. By the continued advance of the label strip 80, its leading end edge has come into contact with the stop 50, as shown in Fig. 2, whereby further advance of the leading section of the label strip is prevented. The position of the stop 50 has been set thus that the label strip 80, in the position shown in Fig. 2 which is the position in which it is in contact with the stop 50, has imparted to it by the inclination of the slot 46 an initial bend in the area of the line 82 (see Figs. 3-5) along which the label strip 80 is to be folded.

In Fig. 3 which shows the folding station 40 and the label strip 80 on a larger scale, the trailing strip

section, i.e. the section behind the line 82 as seen in the direction of strip movement, has been advanced a further distance to the right by the rolls 24, 26. Because the leading section of the label strip, i.e. the section ahead of the line 82, cannot move past the stop 50, the label strip 80 is deflected in the area of the line 82 in a direction perpendicular to the plane of the label strip. The initial bend (α) previously imparted to the label strip 80 along the line 82 by the inclined slot 46 ensures that the strip is deflected towards the nonadhesive strip surface, i.e. downwardly in Fig. 3.

In Fig. 4, the trailing section of the label strip 80 has been advanced a further distance by the rolls 24, 26, whereby the deflected (Fig. 3) section of the strip 80 has been engaged between the peripheral surfaces of the rolls 26 and 54 converging in the direction of the deflection and engaging with the nonadhesive surfaces of the deflected section of the strip 80 on both sides of the line 82. In this manner, the deflected section has been pulled in between the rolls 26 and 54, whereby a sharp fold has been imparted to the strip along the line 82 and, by continued rotation of the rolls 24, 26 and 54, a continuous compression of the adhesive coated surfaces of the unequally long portions of the strip 80 on both sides of the line 82. As is clearly apparent from Fig. 4, the leading end edge of the label strip 80 is moving away from the stop 50 during the folding operation, which means that the strip 80, if the folding station 40 is designed in this manner, must be free-running in the slot 46, without any direct feeding action on the leading label strip section.

It should here be noted that the fact that the peripheral surfaces of the rolls 26 and 54 are shown in spaced-apart relationship in the drawings, merely serves to elucidate the mode of operation of the fold-

ing station 44 and the passage of the tape strip 80 between these rolls. In actual practice, the peripheral surfaces of these rolls may well be much closer to one another or even be maintained compressed, by means of suitable springs or by using a suitable resilient material for the rolls, to ensure that the two unequally long portions of the tape strip 80 are sufficiently compressed.

In Fig. 5, the folding of the label strip 80 is completed in that the entire strip has been pulled in between the rolls 26 and 54 and left them at the lower part of the folding station 40. The belt 56 which is travelling in the direction of arrows B contributes to safely deliver the folded-back label 84 in ready-to-use condition to the collecting trough 60, simultaneously as the air stream from the compressed-air nozzle 62 ensures that the label 84 stays in the trough 60. As will appear from Fig. 5, the folded-back label 84 has a projecting portion 86 with an exposed adhesive coat which, in Fig. 5, is facing to the right, i.e. away from the collector/applicator 42.

Reference is now made to Fig. 6 which again shows the apparatus in its entirety and illustrates how the knife 32 has resumed its retracted upper position to permit feeding of the tape 12 from the rolls 18, 20 to the rolls 24, 26, and how the collector/applicator 42 has been pivoted, by means not shown, about the pin 66 from its vertical position of rest in Fig. 1 to a horizontal collecting position in which the piston rod 70 of the pneumatic cylinder 68 has been extended toward the folded-back ready-for-use label 84 in the collecting trough 60. It should here be noted that the label 84 has been shown but schematically in Figs. 6-8. The suction and pressing block 72 has now been moved into contact with the nonadhesive surface of the longer portion of the label strip 84, and by applying a vacuum to

the ducts 76 and 78, the label 84 is made to firmly adhere to the block 72.

Fig. 7 illustrates the next step and shows how a new label strip 80 has been cut from the tape 12 and advanced into engagement with the stop 50, and how the collector/applicator 42 has returned into its vertical position in which the piston rod 70, the block 72 and the label 84 are retracted.

Fig. 8, finally, illustrates how the label 84 carried by the block 72 is lowered against mutually overlapping newspapers 90 or the like advanced by a conveyor 88 in the direction of arrow C, such that the adhesive face of the projecting portion 86 of the label 84 is adhered to a newspaper 90 at the, as seen in the direction C, leading edge thereof. Furthermore, Fig. 8 illustrates how a label strip 80 in Fig. 7 is folded to form a new folded-back label 84, simultaneously as the first label 84 is applied to the paper 90.

It will be appreciated that the invention is in no way restricted to the embodiment described above and illustrated in the drawings, but may be modified in several ways within the scope defined by the appended claims. For example, the roll 26 may be replaced by two separate rolls, one of which operates with the driving roll 24 and the other with the driving roll 54. Furthermore, it will be appreciated that the length of the label strip 80 and the adjustment of the position of the stop 50 can be selected such that the portion of the label strip 80 ahead of the line 82 constitutes instead the longer one of the two unequally long portions of the label strip 80, in which case the finished folded-back label 84 is instead discharged in a direction obliquely downwardly to the right in the Figures underneath the folding station 40 for collection by a collector/applicator 42 mounted to the right of the folding station. It is also conceivable to provide, in-

stead of the inclined guide surface 48, or as a complement to this inclination, a downwardly directed compressed-air stream at the point of label strip deflection above the adhesive surface of the strip, thereby to bring about, or to promote, the deflection of the label strip in the right direction, i.e. toward the nonadhesive surface.

Finally, it may be preferred to provide immediately to the right of the pair of rolls 18 and 20 a guide wheel or a guide rail pressing against one side of the tape and forming, as the tape is being fed past the cutting station, a temporary longitudinal central stiffening fold or the like in the tape, thereby imparting to the tape 12 such stiffness that it is always conducted straight on to the rolls 24, 26, and this in turn means that the label strips 80 are conducted straight into the folding station 40 to be folded along a line 82 which is invariably perpendicular to the longitudinal or feeding direction of the label strips.

CLAIMS

1. A method for folding single-side adhesive coated label strips (80) of which two parts of different lengths are folded together with their adhesive sides facing each other, along a line (82) transverse to the label strip (80) to form a folded-back label (84) where the end portion (86) of the longer part projects beyond the glued-together label portion (84), thereby exposing the adhesive coat of said projecting end portion, c h a r a c t e r i s e d in that said label strip (80) in the unfolded state (Fig. 1) is advanced substantially perpendicular to the said line (82) towards a stop (50) against which the leading end edge of the label strip (80) is caused to abut (Fig. 2) to prevent continued advance of the leading strip section (80), that the trailing section of the label strip (80) is further advanced (Fig. 3), such that the strip portion located at the said line (82) is deflected towards the nonadhesive surface of the strip (80) in a direction substantially perpendicular to the plane of the label strip, and that counteracting pressure forces (Figs. 4 and 5) are applied to the nonadhesive surfaces of the deflected label strip portion (80) on both sides of the said line (82) to sharply fold the label strip (80) along the said line (82) and compress the adhesive surfaces of the unequally long parts of the label strip (80).

2. A method as claimed in claim 1, c h a r a c t e r i s e d in that said nonadhesive surfaces of the deflected label strip portion on both sides of the said line (82) are subjected, in addition to the said counteracting pressure forces, to advancing forces acting in the deflecting direction (Figs. 4 and 5).

3. A method as claimed on claim 1 or 2, c h a r a c t e r i s e d in that the leading portion of

the label strip (80), located ahead of the said line (82), during its final advance up to the stop (50) is guided in a path (46, 48) inclined at an angle (α) relative to the feeding direction of the trailing portion of said label strip (80), thereby to provide such an initial deflection (Fig. 2) of the label strip portion along the said line (82) that the subsequent deflection (Fig. 3) of said last-mentioned portion is prevented from taking place in a direction toward the adhesive surface of the said label strip (80).

4. A method as claimed in any one of claims 1-3, c h a r a c t e r i s e d in that the position of the stop (50) in the feeding direction of the label strips (80) is made variable.

5. An apparatus for folding together single-side adhesive coated label strips (80), said apparatus comprising means (18, 20, 24, 26) for feeding unfolded label strips (80), and a folding station (40) receiving the unfolded label strips (80) from said feeding means, said folding station being adapted to fold together two unequally long parts of each label strip (80), with the adhesive coated surfaces of said parts facing one another, along a line (82) transverse to said label strip (80) to form a folded-back label (84) where the end portion (86) of the longer part with the exposed adhesive coat projects beyond the glued-together portion of the folded-back label (84), c h a r a c t e r i s e d in that said folding station (40) comprises a stop (50) with which the leading end edge of said label strip (80) is brought into contact by said feeding means (18, 20, 24, 26), said stop (50) being so positioned relative to said feeding means that the latter, when the said leading end edge is in contact with the stop, engage the label strip (80) only behind the said line (82), as seen in the feeding direction, said feeding means (18, 20, 24, 26) being adapted, by the continued advance of the

trailing label strip portion, to force the label strip portion located at the said line (82) to deflect against the nonadhesive label strip surface in a direction perpendicular to the plane of the label strip (80), and at least two feeding and pressing surfaces (26, 54) located between said feeding means (18, 20, 24, 26) and said stop (50) and offset from the path of travel of the label strip (80) between said feeding means and said stop (50) in the direction of the said deflection, said feeding and pressing surfaces converging in the direction of deflection to engage the nonadhesive surfaces of the deflected portion on both sides of the said line (82), thereby to cause the label strip (80) to be pulled in between said surfaces (26, 54), such that these surfaces make a sharp fold in the label strip along the said line (82) and compress the adhesive surfaces of the unequally long parts of said label strip (80).

6. An apparatus as claimed in claim 5, c h a r a c t e r i s e d in that said folding station (40) comprises a guide rail (48) extending from the point of deflection of the label strip (80) to the stop (50) and adapted, by contacting the nonadhesive surface of the label strip (82), to guide the label strip portion adhead of the said line (82) at an angle (α) from the label strip portion behind the said line (82), to provide such an initial deflection of the label strip portion along the said line that the subsequent deflection of the last-mentioned portion is prevented from taking place toward the adhesive coated surface of said label strip (80).

7. An apparatus as claimed in claim 5 or 6, c h a r a c t e r i s e d in that the position of the stop (50) in the feeding direction of the label strip (80) is variable.

8. An apparatus as claimed in any one of claims 5-7, c h a r a c t e r i s e d in that the feeding means (18, 20, 24, 26) comprise a feeding surface (27) engaging the nonadhesive surface of the label strip (80), said feeding

surface passing in a smooth curve at the point of deflection into the surface (26) of the said at least two feeding and pressing surfaces (26, 54) which adjoins the feeding means (18, 20, 24, 26).

9. An apparatus as claimed in claim 8, c h a r a c t e r i s e d in that the feeding surface (25) of the feeding means (18, 20, 24, 26) which engages the non-adhesive surface of the label strip (80) and the surface (26) of the said at least two feeding and pressing surfaces (26, 54) which adjoins said feeding means (18, 20, 24, 26), are the periphery of one and the same roll (26).

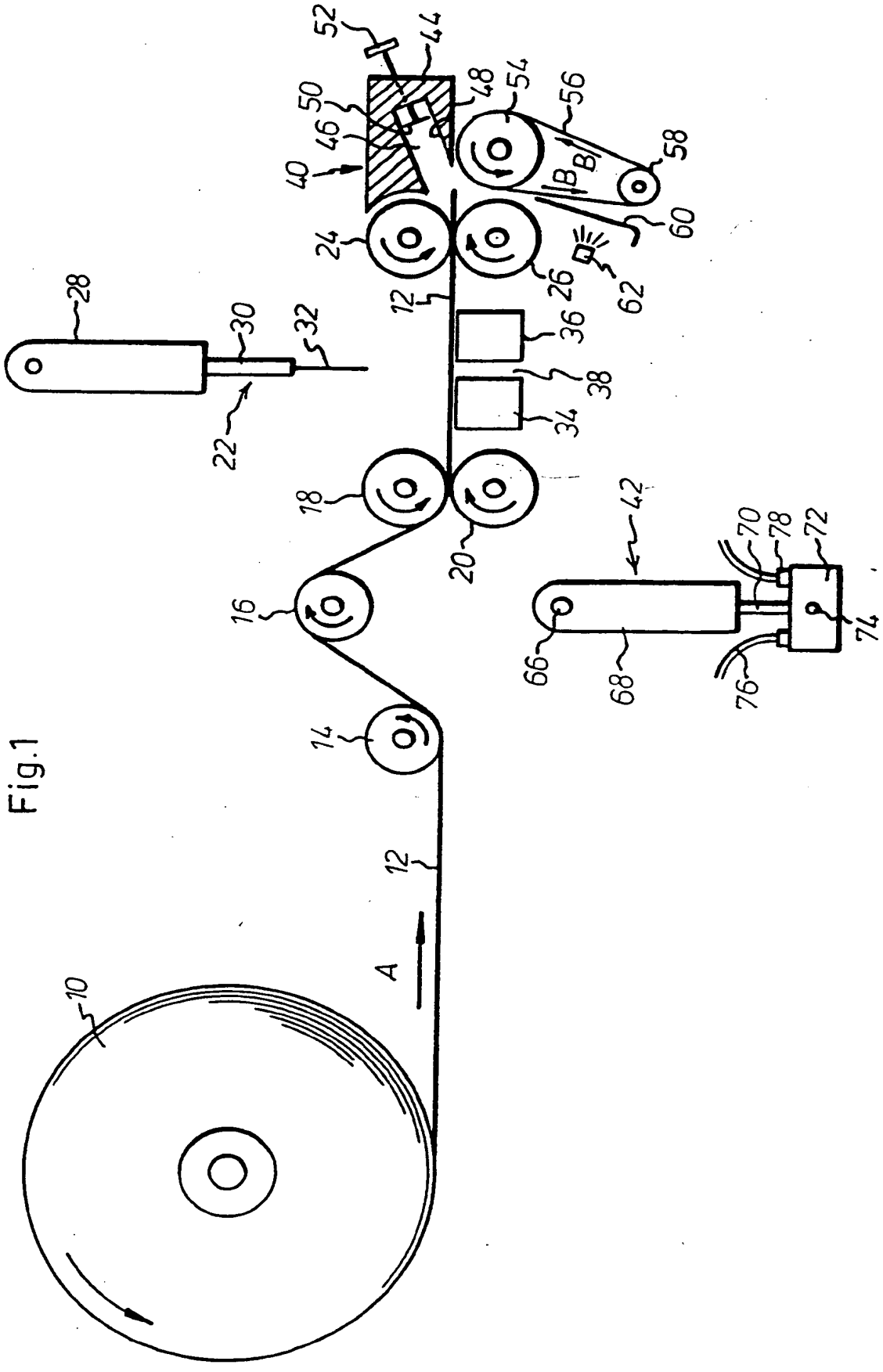
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Fig.1

Fig. 2

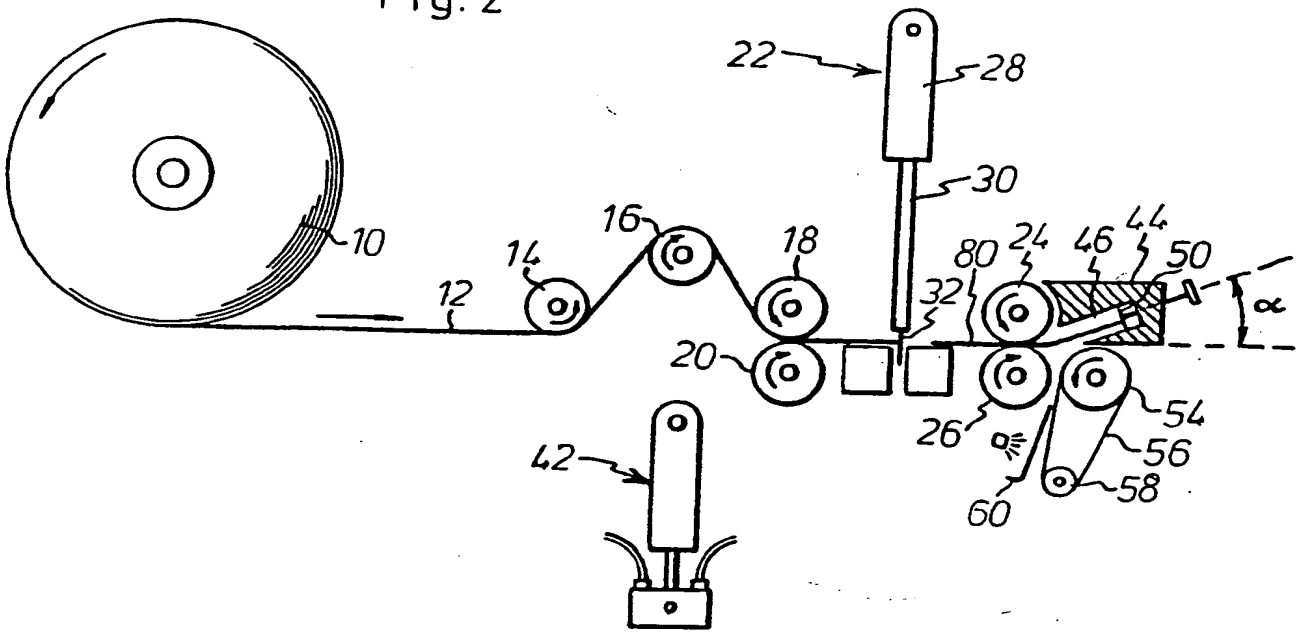
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Fig. 3

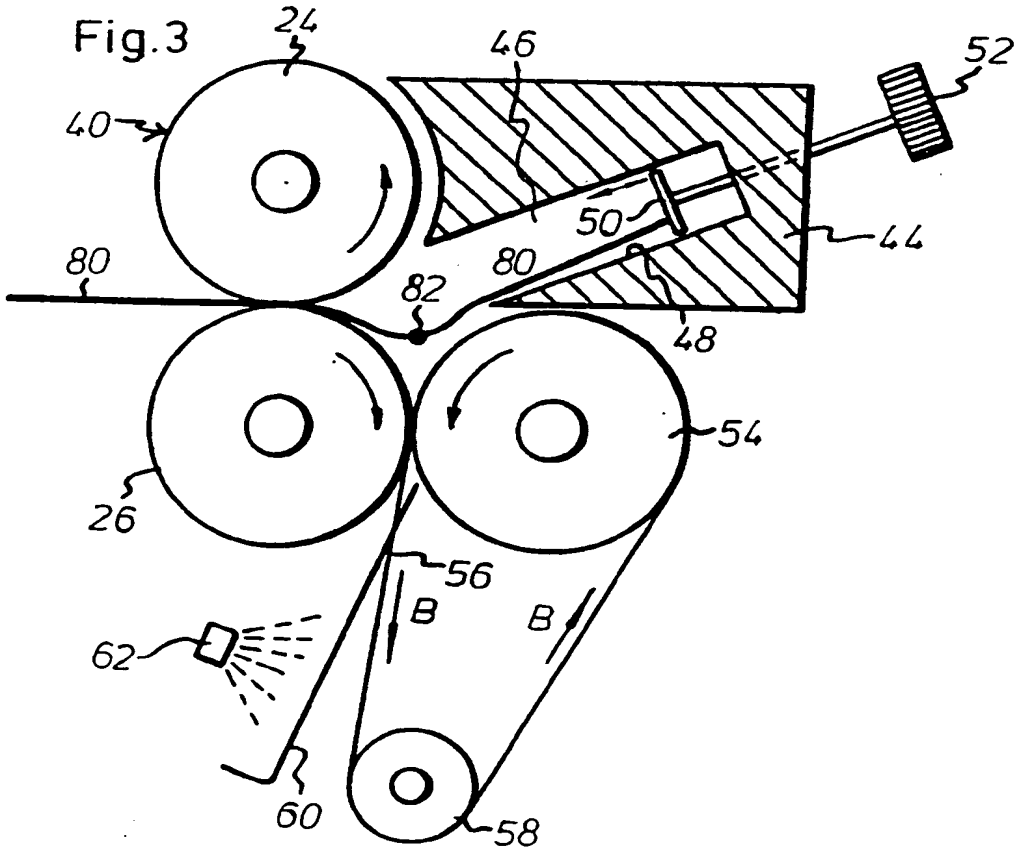
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Fig. 4

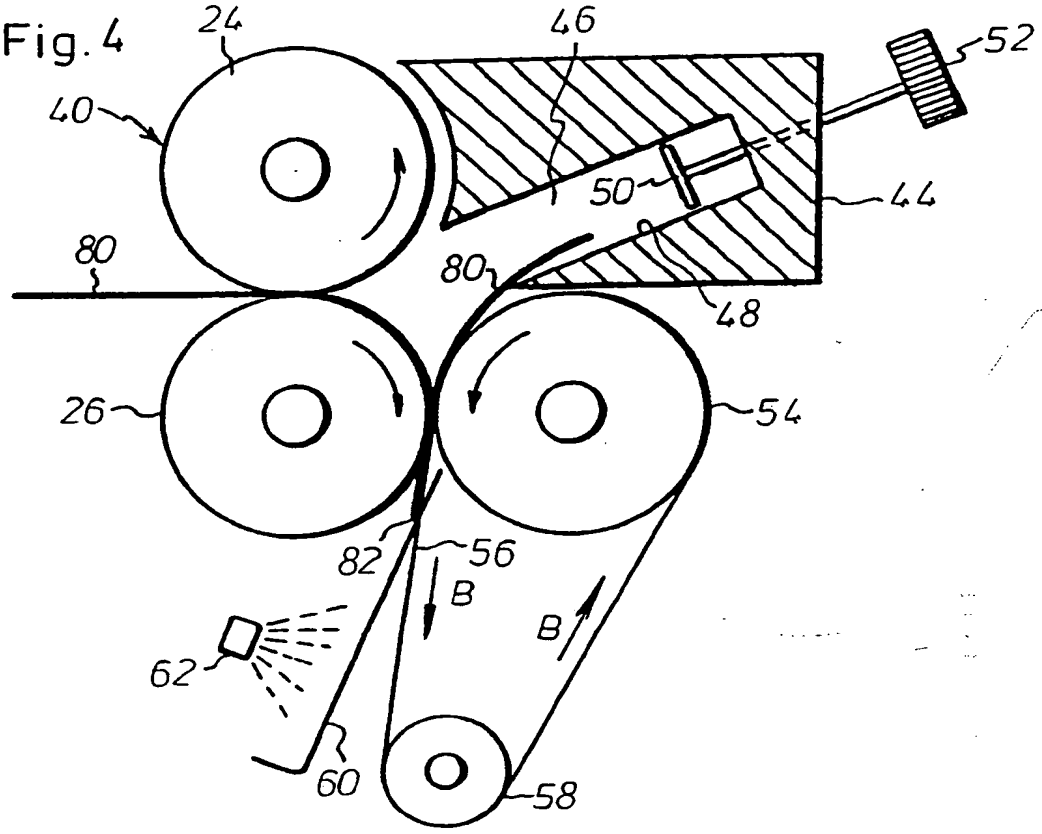
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Fig. 5

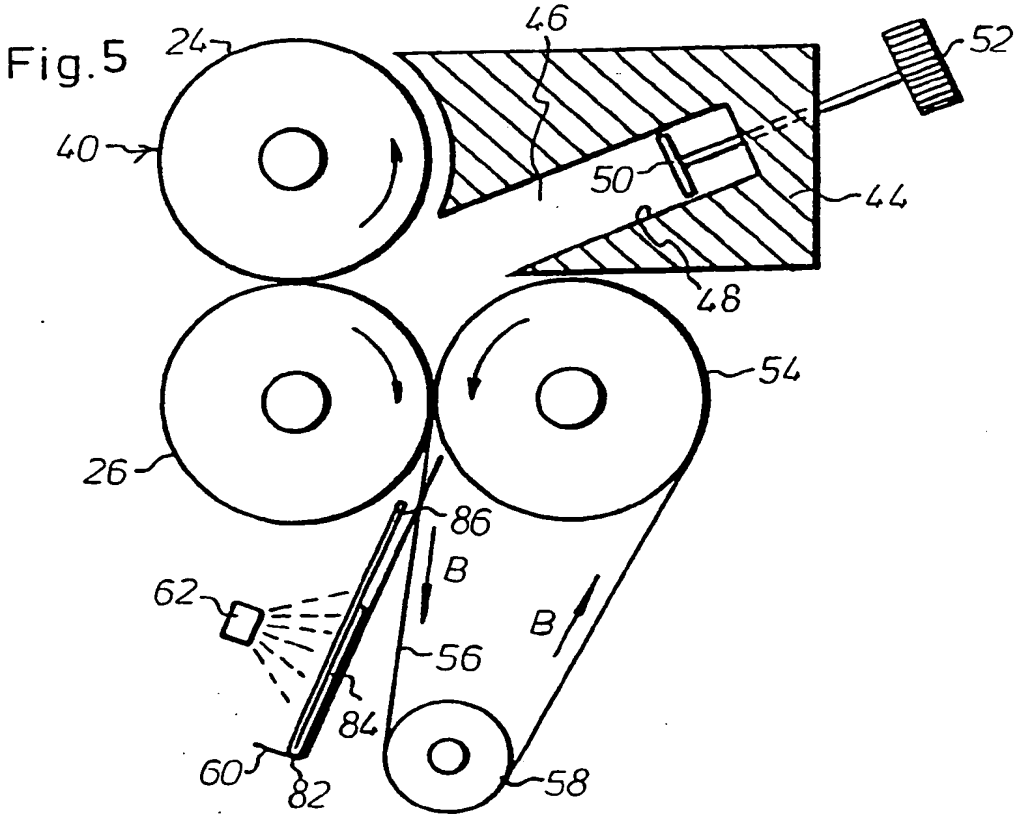
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Fig.6

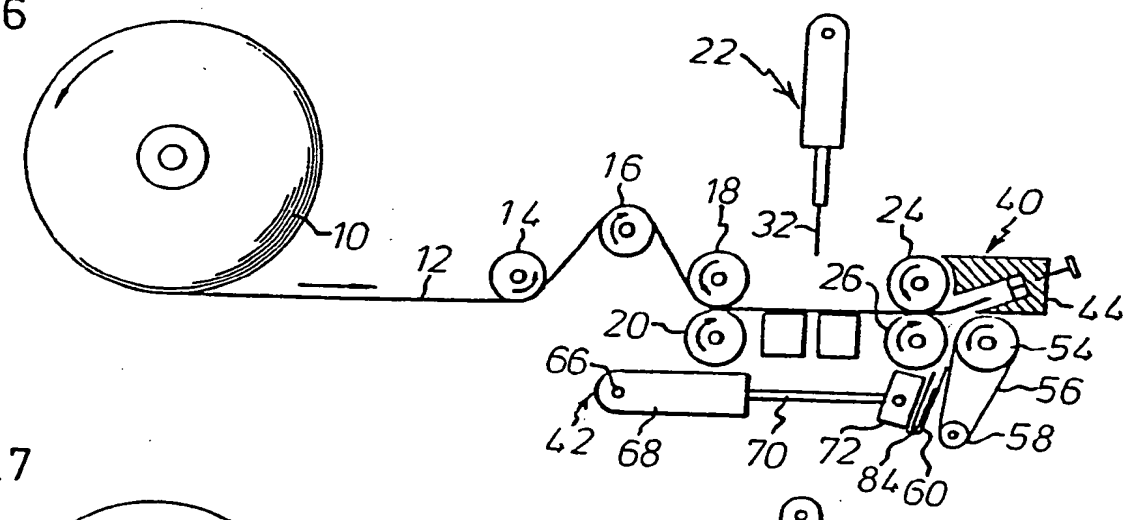


Fig.7

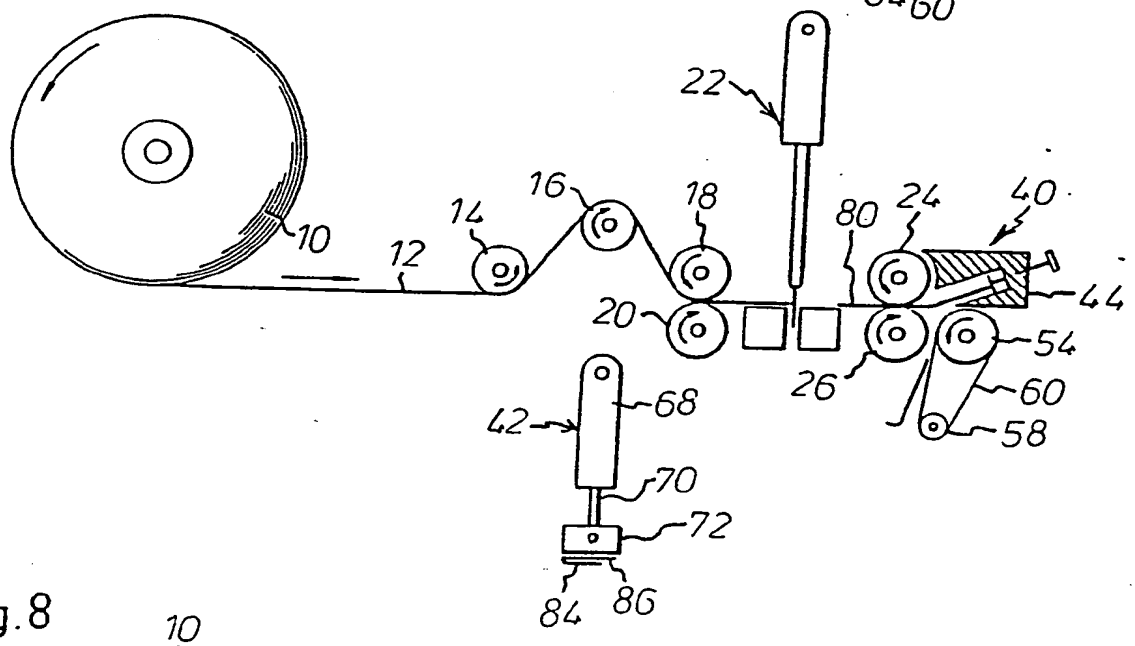
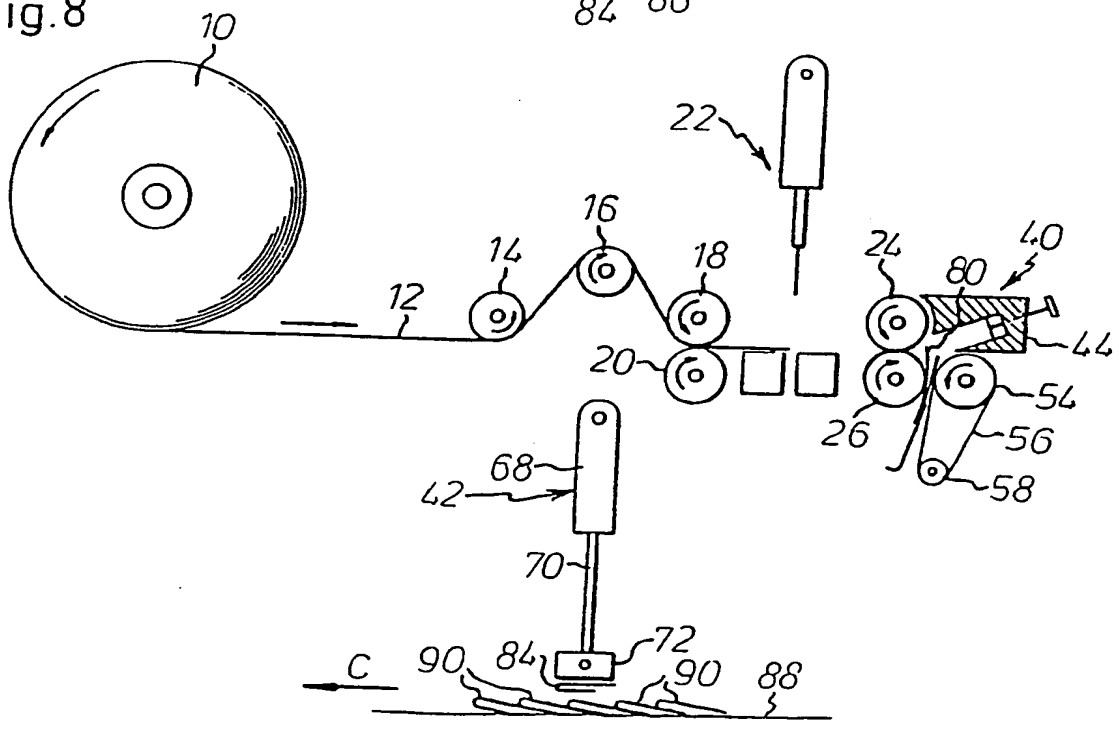


Fig.8



INTERNATIONAL SEARCH REPORT

International Application No PCT/SE88/00678

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC 4

B 31 D 1/02, G 09 F 3/02 // B 65 C 1/00

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC 4	B 31 D 1/00,/02; B 65 C 1/00,/02; G 09 F 3/00,/02,/04, /10
Nat Cl	54b:6/01
US Cl	93:87-89,92; 156:227,247,248,250,259,260,270; 283:18,21,81

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	SE, B, 442 979 (ALF BÄLLGREN) 10 February 1986	1, 5

[10] Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1989-03-03	1989 -03- 06
International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Björn Lindkvist

Form PCT/ISA/210 (second sheet) (January 1985)